

## II. CLAIM REJECTIONS.

### A. 35 U.S.C. § 102

#### 1. The Pending Claims Are Patentable Over Dube.

Claims 19, 21, 23 and 26 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,470,846 to Dube' (hereinafter *Dube*). Applicant respectfully traverses this rejection for the following reasons.

*Dube* discloses an impeller 14 including three pitched blades 20 for immersion into molten aluminum body 11. (Col. 6, ll. 38-42). *Dube* does not teach or suggest Applicant's impeller, nor is it an equivalent structure under 35 U.S.C. §112 (6) since it does not have at least: (a) "means for connecting the impeller to a shaft" as recited in claim 19 (and claims 21 and 23 by virtue of their dependency thereon), (b) an impeller wherein "the height is less than four times the width" (as recited in claim 47), or (c) an "impeller means" (as recited in claim 51). A claim falling within the bounds of 35 U.S.C. § 112, sixth paragraph, must be interpreted to cover the corresponding structure, materials or acts disclosed in the applicant's specification, and equivalents thereof. See 35 U.S.C. § 112, ¶ 6; *B. Braun Medical, Inc. v. Abbott Lab.*, 43 USPQ2d 1896, 1899 (Fed Cir. 1997). The corresponding structure in the specification for the "means for connecting the impeller to the shaft" is, for example, connective portion 106 having a tapered bore. *Dube* does not disclose or suggest this element.

The instant specification discloses the purpose of the tapered bore is easy removal of end 44 of shaft 40 from connective portion 106 (e.g., no metal seeps between end of a straight shaft connection or threaded connection). (Specification, pg. 7, ll. 25-31). The non-threaded, tapered bore alleviates this problem. It is respectfully submitted that *Dube* does not disclose any element that performs the function of connecting the impeller to a shaft and clearly does not produce substantially the same result as the disclosed connective portion 106 (e.g., non-threaded, tapered bore). Consequently, for the foregoing reasons, *Dube* cannot anticipate independent claim 19 or claims 21 and 23, which depend therefrom, nor can it anticipate new claims 31-46.

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With respect to independent claim 26, *Dube* does not teach or suggest an impeller having at least one blade including *a vertical face that directs molten metal outward from the impeller* as recited in claim 26. *Dube* discloses and shows only blades 20 having a pitch with respect to the vertical axis of impeller rotation. *Dube*, col. 8, ll.6-11); i.e., pitch angle  $\theta$  for blades 20 being 30° to 35°; col. 9, ll. 20-21; Figs. 1 and 2.

*Dube* also fails to teach or suggest a structure of an impeller as shown in the present specification (*see, e.g.*, Fig. 3) and as claimed in newly added claims 47-51. *Dube* shows blades 20 that are broad, flat, thin structures. Such blades must function in a molten metal environment and therefore must be comprised of heat-resistant material, such as graphite or ceramic. It would be difficult and expensive to manufacture *Dube's* blades 20 from graphite or ceramic, which are relatively brittle materials. Moreover, blades 20 would be highly susceptible to breakage because they are relatively thin. In contrast, the impeller blades disclosed and claimed herein are preferably machined from components formed of stock having a much thicker cross section than what is shown in *Dube*, and are thus easier to manufacture and less susceptible to breakage. This structure is now claimed in independent claims 47 and 51, and it is not anticipated or rendered obvious by *Dube*.

For at least the foregoing reasons, the §102(b) rejection of claims 19, 21, 23 and 26 is improper and should be withdrawn and Applicant respectfully requests the Examiner to reconsider and withdraw this rejection. Moreover, for at least the foregoing reasons, newly submitted claims 31-52 are patentable over *Dube*.

### **2. The Pending Claims Are Patentable Over Gilbert, Cooper '899, Cooper '986, Cooper '807 and Cooper '045 Patents.**

- Claims 19, 21 and 23 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,598,899 to Cooper (hereinafter *Cooper '899*);
- Claims 19, 21, 23 and 26 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,930,986 to Cooper (hereinafter *Cooper '986*);

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- Claims 19 and 26 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,678,807 to Cooper (hereinafter *Cooper* '807);
- Claims 19, 26, 27 and 28 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,586,863 to Gilbert et al. (hereinafter *Gilbert*); and
- Claims 19,21,23 and 26 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,308,045 to Cooper (hereinafter *Cooper* '045).

Applicant respectfully traverses these rejections for at least the following reasons:

With the exception of *Cooper* '045, all of the cited references disclose closed impellers (i.e., circular impellers with covers or bases connecting the blades, e.g., *Gilbert* '899), as opposed to the claimed open type impellers (e.g., impeller having *outwardly extending blades, there being a space between each of the blades*). See, e.g., Figs. 3 and 5. These closed impellers may be subject to jamming and damage from solid pieces of scrap or dross (present specification, p. 2, ll. 15-16) or clogging between the blades of the impeller or between the blades and a surrounding drum. Moreover, they would not be efficient in creating a downward draw of molten metal, since the covers or bases prevent the impeller blades from efficiently directing the molten metal downward.

By way of contrast, a device utilizing the claimed open impeller reduces jamming or clogging and/or is open to allow for the blades to direct molten metal downward. (*Id.* at ll. 19-22). The open impellers of the present invention: (i) create a draw that draws molten metal and any solid scrap metal contained therein downward into the molten metal bath; and (ii) may operate at lower speeds than conventional impellers and still displace the same amount of molten metal, thereby reducing vibration, requiring less maintenance and fewer replacement parts (*Id.* at p. 3, ll. 14-18).

Applicant respectfully submits the cited references do not teach or suggest at least the following limitations of the claimed invention:

1. **Cooper '899 and Cooper '986** fail to teach or suggest at least the claimed open impeller or an impeller having *outwardly extending blades* (claims 19, 21, 23, 26, 31, 40, 46 and 47); equivalent structure to a *means for connecting the impeller to a shaft* under 35 U.S.C. § 112 ¶ 6 (claims 19, 21 and 23); an impeller having at least one blade including a *vertical surface that directs molten metal outward from the impeller* (claim 26)<sup>1</sup>, or *impeller means* (claim 51).
2. **Cooper '807** fails to teach or suggest at least an open impeller or an impeller having two or more *outwardly extending blades* (claims 19, 26, 31, 40, 46 and 47); an equivalent structure to a *means for connecting the impeller to a shaft* under 35 U.S.C. § 112 ¶ 6 (claims 19, 21 and 23), or *impeller means* (claim 51).
3. **Gilbert** fails to teach or suggest at least the claimed open impeller or an impeller having *outwardly extending blades* (claims 19, 21, 23, 26, 31, 40, 46 and 47); an equivalent structure to a *means for connecting the impeller to a shaft* under 35 U.S.C. § 112 ¶ 6 (claims 19, 21 and 23); or *impeller means* (claim 51).

**Cooper '045** discloses impellers 100, which include threaded apertures 101 for receiving corresponding threads 202 of shaft 200. This type of connection suffers from the drawbacks previously discussed, and does not solve the problem of difficulty in removing impellers from drive shafts. The present invention, which includes impellers having non-threaded, tapered bores, alleviates these problems. (Specification p. 7, ll. 25-31). Nor does **Cooper '045** teach, among other things, “outwardly extending blades” or an “open” impeller.

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<sup>1</sup> Applicant submits that element 33 of **Cooper '899** and element 57 of **Cooper '896** are trailing edges of blades 13, 49 as opposed to a vertical surface that directs molten metal outwardly.

For all the foregoing reasons, Applicant respectfully submits that the pending claims are not anticipated by nor rendered obvious by any of the cited references and requests the Examiner to reconsider and withdraw all §102 rejections of record.

**B. 35 U.S.C. § 103**

**1. Cooper '045 in view of Russian '312.**

Claims 19, 20, 21, 23, 25 and 26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Cooper '045* in view of Russian Patent 773,312 (hereinafter *Russian '312*). Applicant respectfully traverses this rejections for the following reasons.

The Examiner alleges that *Cooper '045* discloses all of the claimed invention except for a threaded portion below the impeller and a nut applied to the threaded portion and that *Russian '312* discloses it is well known to employ a nut fastener at the end of a drive shaft to attach an impeller and thus it would have been obvious to modify *Cooper '045* with the nut and lower threaded portions as taught by *Russian '312* for less complicated machining of the impeller and easier access to the threaded section where impeller replacement is required.

Applicant respectfully submits that *Russian '312* does not teach or suggest a nut or threaded portion whatsoever, not to mention “a nut fastener at the end of a drive shaft to attach an impeller (3) to a drive shaft where the nut and threaded end of the drive shaft is located below the impeller” as alleged by the Examiner. There is simply no reference in the patent text or drawing to support the Examiner’s allegation regarding any teaching of a nut or threaded portion. Applicant can only surmise that the Examiner refers to the element on the side of *Russian '312* impeller 3 opposite the drive source, as depicted in the drawing of *Russian '312*. However, there are no threads or nut head shown. This illustrated portion could be anything, for example, a bolt, a seal, part of the impeller, part of the shaft, a cap, a spacer, a plug, or any number of additional

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items or other types of fasteners as well as being merely a drawing guide such as dimension lines, lead lines, center lines, or perspective lines.<sup>2</sup>

Because *Russian* '312 does not teach or suggest any threaded portion of a shaft below an impeller or a nut, the §103 rejection based thereon should be withdrawn.

Moreover, even if *Russian* '312 did disclose a nut as alleged by the Examiner (*arguendo*), and even when considered in combination with *Cooper* '045, the non-threaded, tapered bore of the impeller claimed in this application would still not be rendered obvious.

There is no teaching in either cited reference that such a connection would be desired, possible, and/or provide any benefit. The Examiner's suggested motivation for making such a combination, i.e., "less complicated machining of the impeller" and "easier access to the threaded section when impeller replacement is required" is not supported by any teachings of the prior art references, and appears to be based upon hindsight, using the understanding of Applicant's invention. The inventive connection portion overcomes problems associated with, but not recognized by, impeller/shaft connections of the prior art. Consequently, Applicant respectfully submits the claims are novel and non-obviousness over *Cooper* '045 and *Russian* '312, taken alone or in combination. For the foregoing reasons, Applicant requests the Examiner to reconsider and withdraw this §103(a) rejection.

**2. *Cooper* '899, *Cooper* '986, or *Cooper* '045.**

Claims 22, 24, 27, 28, 29 and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the subject inventor's previous patents '899, '986 or '045. The Examiner alleges that addition of the number of blades, varying sizes, types of connection of the rotor

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<sup>2</sup> Applicant notes that the same rectangle is also shown on the opposite side of the impeller.

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would be obvious to the skilled artisan since the impellers of the prior art operate in substantially the same manner for substantially the same purpose as instantly claimed.

Applicant respectfully traverses these rejections and submits the claimed invention is patentable over these cited references, alone or in any combination, for at least the reasons previously discussed. The presently claimed inventions do not operate in substantially the same manner; notably, the claimed connection between the rotor and shaft is superior as discussed herein. In addition, the claimed impeller configurations improve over prior art impeller efficiency, resistance to damage and other advantages as previously discussed. For the foregoing reasons, Applicant submits the claims are patentable over *Cooper* '899, *Cooper* '986, and/or *Cooper* '045, alone or in combination and respectfully requests the Examiner to reconsider and withdraw the §103 rejections based thereon.

### III. NEW CLAIMS.

By this amendment Applicant adds new claims 31-46 for which examination and favorable consideration is respectfully requested. Claims 31-46 include similar limitations as recited in claims 19-30 and are thus also patentable for the reasons discussed herein. Claims 47-52 include limitations directed to the impeller structure that render it relatively simple to manufacture and less prone to damage. This open impeller structure does not include the thin, steep blades of *Dube*, and is not anticipated or rendered obvious by the prior art of record.

### IV. CONCLUSION.

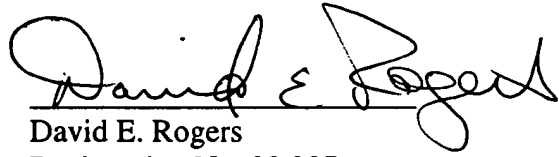
In view of the above, reconsideration is respectfully requested and allowance of this application is now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone

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interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below. Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee or deficiency thereof, except for the Issue Fee, is to be charged to **Deposit Account No. 19-3878**.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "David E. Rogers", is written over a horizontal line.

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